WALTER H. FLOOD & CO., INC.

2nd

Soil Investigation No. 74050138-1

Proposed Solid Waste Disposal Facility

Central Avenue and Sauk Trail

Cook County, Illinois

Prepared for

John Sexton Sand and Gravel Co.

900 Jorie Boulevard

Oak Brook, Illinois 60521

December 3, 1974

Walter H. Flood
& Co., Inc.
ENGINEERS
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HILLSIDE, ILLINOIS 60[illegible]
TELEPHONE [illegible]
CHICAGO NUMBER [illegible]

December 3, 1974

ohn Sexton Sand and Gravel Co.
00 Jorie Boulevard
ak Brook, Illinois 60521

Re: Soil Investigation No. 74050138-1
Proposed Solid Waste Disposal Facility
Central Avneue near Sauk Trail
Cook County, Illinois

ttn.: Mr. Arthur Daniels

entlemen:

nclosed is our report addendum of the subsoil investigation for the reference project. This ddendum should be attached to and considered part of our original report.

our attention is called to the presence of relatively permeable layers of sand and silt at epths of about 30 feet at Boring 7 and to the somewhat erratic stratification encountered t the site.

f you have any questions concerning this report, or should we be able to assist you in any y, please call upon us.

e soil samples are being retained in our laboratory for thirty days for your possible ture reference.

Respectfully submitted,

WALTER H. FLOOD & CO., INC.
James E Schueler P.E
James E. Schueler RJF
Registered Professional Engineer
Illinois 32325
Project Engineer
Raymond J Flood
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S:RJF:SMW

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WALTER H. FLOOD & CO., INC. Soil Investigation No. 74050138-1

I. Scope

This report has been prepared from the furnished and gathered data, in accordance with the general conditions attached hereto, and represents the results of the subsoil investigation for the proposed solid waste disposal facility at the subject site which is just East of Central Avenue and just North of Sauk Trail in Cook County, Illinois. Our original investigation, Report No. 74050138, involved six (6) borings made around the perimeter of a former borrow area just North of the current site.

The purpose of the investigation is to secure and log subsoil information, to record the geological nature, type, consistency and thicknesses of the various soil strata as encountered in the borings, to perform laboratory tests, and to evaluate all of the data obtained. Conclusions and recommendations are provided regarding the general suitability of subsoils encountered at the site for the development of the proposed solid waste disposal facility to aid in the appraisal of the property and to assist in the design and construction of the specific project at the location discussed herein.

II. Site Location

The site which is the subject of this investigation and report addendum is located in Cook County, Illinois, and is roughly 30 acres in area. The site is bounded on the West by Central Avenue, on the South by Sauk Trail, on the East by Interstate Highway-57, and on the North by the roughly 40 acre site which was the subject of our original investigation. The site is located in the SW¼ of Section 28, Township 35 North, Range 13 East of the Third Principal Meridian.

III. Site Topography

The surface topography of the subject site may be characterized as gently undulating with a slight slope toward the north and east in general. The total relief over the site is estimated at about 5 feet.

IV. Site Geology

The subject site is located in a geologic feature known as the Valparaiso Groundmoraine. The materials of the Valparaiso Groundmoraine are glacial tills, or debris deposited by the great glacier, which are largely clayey and somewhat erratic in the general region, and are known to contain deposits and layers of sand and silt.

V. Soil Conditions and Characteristics

Four (4) field test borings, Borings 7 through 10, were made at the site for this investigation. The soil conditions encountered are summarized here for your convenience. Surface materials consisted of black loam "topsoil" at all four boring locations, and this "topsoil" layer varied in thickness from about 1.0 to 2.5 feet. The "topsoil" was under-

V. Soil Conditions and Characteristics (Continued)

and clayey silts, which extended to depths below existing ground varying between about 30 feet (Boring 7) and about 59.5 feet (Boring 8). These primarily cohesive upper soils were quite variable in consistency and contained relatively thin layers of sand and silt in a random fashion. The primarily cohesive upper soils were underlain by erratic strata of more granular materials, largely silts and sands with interbedded silty clay and clayey silt.

In general, then, the upper soils were primarily cohesive and relatively impermeable but contained random relatively thin layers of coarser and more permeable material. The lower soils within the boring depth were, in general, more granular and permeable, occurring in erratic layers of silts and sands intermixed and interbedded with silty clay.

The summary of soil conditions above is not intended to reveal all variations encountered. Please refer to the boring logs included with this report for more detailed information concerning visual descriptions of samples retrieved, approximate depths to strata boundaries, field-measured Standard Penetration Resistances, laboratory test results, water level readings, and other pertinent subsoil investigation data.

VI. Feasibility of Site for Development of Solid Waste Disposal Facility

It is our understanding that current plans call for possible development of the subject site for solid waste disposal by trench or area excavation methods. Such excavation methods are ordinarily more economically feasible in primarily cohesive and relatively impermeable subsoils. Since a sufficient thickness of the highly impervious silty clay tills will have to be left in place to prevent downward migration of leachate from the solid waste fill, trench or area excavation depths will be limited by the depth of the cohesive soils. It is recommended that a minimum of 5 feet of the highly impervious clay tills be left in place in excavation bottoms. Based on the conditions encountered at Borings 7, 8, 9, and 10, it appears that excavation depths will be limited to about 25.0 feet(Boring 7) to about 54.5 feet (Boring 8) unless special seal construction procedures are to be utilized.

Local and random sand layers were encountered in the cohesive tills, and these sand layers appear to be water bearing. As these permeable layers are encountered during excavation, some pumping may be required. The sand strata encountered at the borings are relatively thin, and quantities of water are expected to be moderate. Where such sand seams are encountered in perimeter walls of the soild waste fill area, such seams will have to be sealed in some fashion to preclude the lateral migration of leachates. The silty clays removed from the excavations will provide excellent sealing materials, and should be

VI. Feasibility of Site for Development of Solid Waste Disposal Facility

placed over all sand seams exposed to a minimum thickness of 2 feet. Consideration may also be given to other types of seals such as bentonite or bituminous materials.

When the solid waste fill has been completed, the relatively impermeable clay tills should be used for final cover to prevent seepage of leachate through the final slopes.

VII. Proposed Improvement

The furnished data for the proposed improvement is as follows: tentative plans call for the development of a solid waste disposal facility at the reference site using trenching or area excavation methods.

III. Laboratory Soil Tests

Laboratory tests were performed on representative samples of the soils. Penetrometer and natural moisture content (ASTM D2216) tests were performed on samples of cohesive soils. Calibrated penetrometer readings were substituted for the unconfined compressive strength test since soil strengths will be used primarily for classification purposes. The maximum reading of the penetrometer is 9000 pounds per square foot. The results of the penetrometer and moisture content tests are included on the final test boring logs.

IX. Field Investigation

The four (4) test borings were located in the field by means of tapemeasure as shown on the enclosed diagram. Relative ground surface elevations were determined from the Benchmark assumed as Elevation 730 (estimated from quadrangle maps) taken on the pavement at the intersection of the centerlines of Central Avenue and Sauk Trail. The four (4) test borings were taken to depths as determined by consultation with your firm. The borings were started on 11/22/74, and completed on 11/25/74. A hollow stem auger type of drilling was used to make the test borings. Split tube (ASTM D1586) type of sampling was used in the borings at 3.5 foot maximum intervals. The soil types, nature, consistency, strata depths and thicknesses, the sampling data and other conditions apt to affect design or construction were recorded on the field logs. In the split tube sampling, the standard penetration "N" (the number of blows of a 140-pound hammer dropping 30 inches to drive the standard 2-inch O.D. split tube) was recorded in 6-inch increments and entered on the field logs. Representative samples from the split tube were placed in jars, sealed, and delivered to the laboratory for further classification and testing. In the non-cohesive soils the hollow stem auger was used to prevent caving of the soils. During drilling, immediately after completion of drilling and more than 48 hours after completion of drilling, readings of the ground water were taken in the bore holes and the readings recorded on the boring logs.

5. General Conditions

A. Report Preparation and Review

This report has been prepared in accordance with the generally accepted Soil and Foundation Engineering practices. No other warranty, expressed or implied, is intended. The report has been prepared for the client for his stated purposes only, and the report may not contain sufficient recommendations nor information for other parties or uses. In the event that any changes in the design of the project, however slight, are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations of this report modified or reaffirmed in writing. In the event that conclusions and recommendations based upon the data of this report are made by others, such conclusions and recommendations are not our responsibility unless a review is made and a concurring opinion is submitted in writing.

B. Test Boring Locations

The test borings have been located by the method stated in this report. The test borings were located to be within 10 feet from the location shown on the diagram enclosed with this report. Elevations of the ground surface at the boring locations are to an accuracy of plus or minus 0.5 feet.

C. Test Boring Logs

Field boring logs were prepared in the field by a qualified driller foreman. These field logs, on file in our office, give pertinent field data including boring number, date(s) of taking the boring, methods of drilling and sampling, depths of samples, descriptions of the various soils sampled, observed, and estimated between samples, ground water readings, and other observed conditions considered pertinent to the investigation. The soils between samples may have been determined by the drilling foreman based upon "feel" of the drill bit, or wash cuttings. The changes in soil strata may be transitional rather than abrupt, particularly with respect to coloring, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because sampling tubes seldom retain these larger sized soil particles. The field soils descriptions have been reviewed, and reaffirmed or modified by visual examination of soil samples by qualified soils personnel in accordance with the enclosed boring log explanation sheet. Soil consistency classifications are based upon the laboratory tests or field penetration tests. The final test boring logs have been prepared from the field data, the sample review, and the laboratory data, and therefore are based upon both interpretive and factual data.

X. General Conditions (Continued)

D. Ground Water

Our interpretations of the ground water levels on the site have been made based upon the water level readings stated on the soil boring logs. However, it must be noted that fluctuations in the level and quantity of the ground water may occur due to variations in rainfall, temperature, soil permeability, and other factors not evident at the time of the water level measurements. The probability of ground water level variation is anticipated, and the design drawings and specifications should accomodate such possibilities, and construction planning should be based upon such assumptions and variations of the ground water.

E. Changed Soil Conditions

The analysis and recommendations made in this report are based upon the data obtained from the borings performed at the locations as indicated on our enclosed drawing. This report does not reflect any soil variations which may occur between the borings. Since the nature and extent of soil variations between the borings may not become evident until construction, it may be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation period of construction. It is recommended that we be retained to perform continuous construction review during the excavation, backfill, and foundation phases of the project. We can assume no responsibility for the construction compliance with the recommendations unless we have been retained to perform this on-site review during construction.

F. Allowable Soil Bearing

The allowable soil bearing values recommended in this report include a minimum factor of safety as noted with respect to the minimum soil strength, with the estimated settlement noted. The allowable soil bearing is in excess of the existing overburden stress at the recommended depth.

G. Construction Inspection

The soil test borings performed for this investigation do not necessarily give a complete picture of all of the soils that may be encountered in excavating for the project. Soil variations are apt to be experienced. It is, therefore, recommended that qualified soils personnel be engaged to inspect all subsoils exposed during stripping, site grading, and excavation operations. These inspections should occur [illegible] are intended to verify similarity between

General Conditions (Continued)

G. Construction Inspection

soils encountered during construction and during field boring operations. Specifically, the construction inspection of subsoils should include determination of "topsoil" stripping depth, verification of foundation bearing soils, tests of cohesive soils to verify soil bearing capacities, approval of fills, and density tests of fills to insure that fills are placed to specification requirements.

If piles not easily spliced are selected for the foundations, test piles should be driven at representative locations on the project site to determine possible pile length variations. Pile capacities of all driven piles should be determined during pile driving operations utilizing an approved dynamic pile formula. Pile load tests are recommended to substantiate the pile design loadings.

If caisson foundations are included in the recommendations of this report, construction inspection is recommended to verify design dimensions, plumbness, bottom cleanliness, and bearing capacities of the foundation soils.

H. Settlement

Initial foundation settlement is due to the immediate elastic deformation of the soils as the soils are stressed. This deformation leads to a certain amount of initial foundation settlement, which is considered normal. For the recommended bearing values at the stated depths, this initial settlement has been computed or estimated and the magnitude detailed in the Foundation Recommendation section of this report.

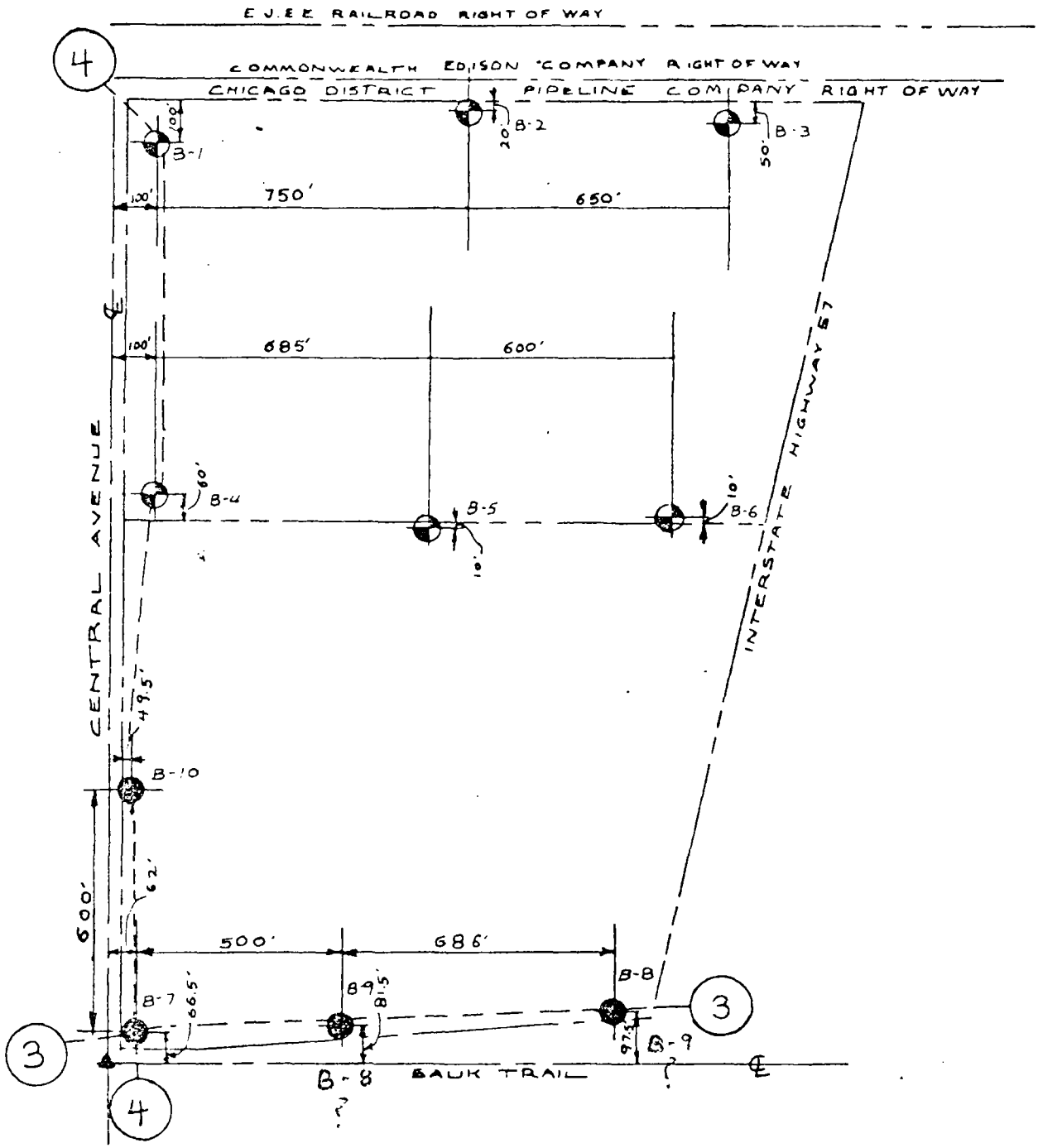
"Shrinkage" settlement is caused by the shrinkage of foundations soils because of drying. Clay and silt soils characteristically shrink until their moisture content is reduced to a limiting value called the shrinkage limit. Although the drying of soils is not common in the area, the stated soils are susceptible to shrinkage. Prolonged droughts, withdrawal of soil moisture by trees and shrubs, and evaporation can cause "shrinkage" settlement of structures founded on or above these soils. The general area practice is to assume this risk of possible "shrinkage" settlement of the shallower foundations rather than to utilize more costly, deeper foundations.

Consolidation, or long-term, settlement is due to the gradual expulsion of pore [illegible] rate under constant applied loads. Soft soils are subject

X. General Conditions (Continued)

H. Settlement

to consolidation under any significant increased loading. Laboratory consolidation tests provide the most reliable data on which to base estimates of magnitudes and time rates of consolidation of the soils in the field. Our consolidation analysis should provide a fairly reliable prediction of settlement assuming that the soft soils are not more compressible nor thicker than encountered at the boring locations, and provided that loads furnished or assumed are close to actual applied loads. Total consolidation settlement is usually divided into primary and secondary phases. The primary consolidation of inorganic compressible soils usually takes place over a several year period, and secondary consolidation settlement, though not as predictable, is generally negligible. For organic compressible soils, the secondary consolidation settlement could exceed the estimated primary settlement over the life of the proposed structure.



PREVIOUS BORINGS

NEW BORINGS (11/73)

BENCHMARK :

SOIL PROFILE LOCATION 1 — 1

N

SOIL BORING LOCATIONS
CENTRAL AVENUE & SAUK TRAIL
COOK COUNTY, ILLINOIS

WALTER H. FLOOD & CO. INC.

SCALE 1"=400±'	BY W. A. M.
JOB/LAB NO 7405015B-1	DATE 12-3-74

FOR: JOHN SEXTON SAND & GRAVEL CO.

PROJECT: CENTRAL AVENUE NEAR SAUK TRAIL

LOCATION: COOK COUNTY, ILLINOIS

Walter H. Flood & Co., Inc.
ENGINEERS

SOIL BORING LOG NO. 7

METHOD OF BORING: HS
SPLIT SPOON SIZE: 2 IN.
WT. OF HAMMER 140 LBS.
INCH DROP 30
SHELBY TUBE SIZE
CASING USED 60'-2½"IDHS

WATER LEVEL READINGS
26.0' W.D.
39.0' B.C.R.
29.6' A.C.R.
25.5' @ 48+ HRS. A.D.
HRS. A.D.

DRILLING DATA
DATE 11/22/74
FOREMAN DL
JOB NO 74050138-1
VERT SCALE 1" = 10.0'

BACKFILLING DATA
DATE
BY
METHOD
GROUT
QUANTITY

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION
	0.0						GROUND SURFACE ELEVATION 728
	1.0						Black loam "topsoil"
		1	ss	10			Tough to very tough brown clay, some black loam
		2	ss	5			
	5.0	3	ss	23			Very tough to hard brown and gray silty clay
		4	ss	26			
		5	ss	21			
		6	ss	26			
		7	ss	20			
	16.5						
		8	ss	12			Stiff to tough gray silty clay
		9	ss	11			
	22.0						
		10	ss	17			Very tough gray clayey silt, trace of large gravel with sand layers
		11	ss	11			
		12	ss	25			
	30.0						
		13	ss	25			Medium dense fine to coarse gray sand; some silt
	32.5	14	ss	26			Hard gray clayey silt with small gravel
	35.0						
		15	ss	38			Medium dense to dense gray coarse sand with clay layers
		16	ss	17			
	40.0						
		17	ss	14			Tough to very tough gray silty clay with sand layers, trace of small gravel
		18	ss	19			
	45.0	19	ss	21			Medium dense gray fine to medium sand, trace of silt *
	47.5						
		20	ss	8			Loose gray silt with fine sand and small gravel
		21	ss	9			
	52.5	22	ss	36			Dense fine gray sand
	55.0						
		23	ss	30			Dense fine gray silt with sand and small gravel
	58.5	24	ss	22			Tough gray silty clay with**
	60.0						End of Boring * and small gravel ** small gravel

Qu ● LABORATORY O PENETROMETER × 1000

2 4 6 8 10

9000+ 9000+ 9000+ 9000+ 113.6

10 20 30 40 50

Wc ▲ NATURAL

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION

LEGEND. A -AUGER
ACR -AFTER CASING REMOVAL
AD AFTER DRILLING

DEPTH -FEET BELOW GROUND SURFACE
FT -FISH TAIL
HS -HOLLOW STEM AUGER
L -SAMPLE LENGTH

S -SAMPLE NUMBER
SS -SPLIT SPOON
ST -SHELBY TUBE
T -TYPE OF SAMPLE

OR: JOHN SEXTON SAND & GRAVEL CO.

ROJECT: CENTRAL AVENUE NEAR SAUK TRAIL

OCATION: COOK COUNTY, ILLINOIS

Walter H. Flood & Co., Inc.
ENGINEERS

SOIL BORING LOG NO. 8

ETHOD OF BORING: HS	WATER LEVEL READINGS	DRILLING DATA	BACKFILLING DATA
PLIT SPOON SIZE: 2 IN.	▽ 7.0-45.0' W.D.	DATE 11/22/74	DATE
T. OF HAMMER 140 LBS.	54.0' B.C.R.	FOREMAN DL	BY
INCH DROP 30	· A.C.R.	JOB NO 740501 38-1	METHOD
HELBY TUBE SIZE	7.7 @ 24+ HRS. A.D.		GROUT
ASING USED 60'-2½"IDHS	8.0 @ 48+ HRS. A.D.	VERT SCALE 1" = 10'	QUANTITY

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION
	0.0						GROUND SURFACE ELEVATION 735
							Black loam "topsoil"
	1.0	1	ss	11			Very tough to hard brown silty clay, trace of large gravel
		2	ss	9			
		3	ss	17			
	7.5	4	ss	18			Medium dense brown clayey sand
	10.0	5	ss	11			Tough to very tough gray silty clay, trace of small to large gravel
		6	ss	12			
		7	ss	7			
		8	ss	18			
		9	ss	15			
		10	ss	21			
	25.0	11	ss	7			Soft to tough gray silty clay
		12	ss	15			
		13	ss	6			
	32.5	14	ss	17			Very tough gray silty clay, trace of large gravel and clayey silt layers
		15	ss	13			
		16	ss	18			
		17	ss	19			
		18	ss	17			
	45.0	19	ss	10			Loose to medium dense gray silt
	47.5	20	ss	25			Tough to very tough gray silty clay, trace of small gravel
		21	ss	30			
		22	ss	17			
		23	ss	20			
	59.5	24	ss	35			Medium dense brown fine sand
	60.0						End of Boring

Qu ● LABORATORY ○ PENETROMETER
X 1000
2 4 6 8 10
9000+

10 20 30 40 50
Wc ▲ NATURAL

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION

LEGEND:
A AUGER
ACR AFTER CASING REMOVAL
AD AFTER DRILLING
BCR BEFORE CASING REMOVAL
DEPTH - FEET BELOW GROUND SURFACE
FT - FISH TAIL
HS - HOLLOW STEM AUGER
L - SAMPLE LENGTH
S - SAMPLE NUMBER
SS - SPLIT SPOON
ST - SHELBY TUBE
T - TYPE OF SAMPLE

FOR: JOHN SEXTON SAND & GRAVEL CO.

PROJECT: CENTRAL AVENUE NEAR SAUK TRAIL

LOCATION: COOK COUNTY, ILLINOIS

Walter H. Flood & Co., Inc.
ENGINEERS

SOIL BORING LOG NO. 9

METHOD OF BORING: HS	WATER LEVEL READINGS	DRILLING DATA	BACKFILLING DATA
SPLIT SPOON SIZE: 2 IN.	24.0-36.5' W.D.	DATE 11/25/74	DATE
WT. OF HAMMER 140 LBS.	56.0' B.C.R.	FOREMAN DL	BY
INCH DROP 30	39.0' A.C.R.	JOB NO. 740501 38-1	METHOD
SHELBY TUBE SIZE	31.0' @ 4 HRS. A.D.		GROUT
CASING USED 60'-2½"IDHS	HRS. A.D.	VERT. SCALE 1" = 10'	QUANTITY

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION
							GROUND SURFACE ELEVATION 731
	0.0	1	ss	16			Black loam "topsoil"
	2.5	2	ss	18			Hard to very tough brown and gray silty clay
		3	ss	15			
		4	ss	22			
		5	ss	17			
	12.0	6	ss	11			Medium dense gray sandy silt
	15.0	7	ss	15			Tough to hard gray silty clay, trace of small gravel and sand layers
		8	ss	14			
		9	ss	10			
		10	ss	23			
		11	ss	11			
		12	ss	16			
		13	ss	18			
		14	ss	25			
		15	ss	19			
		16	ss	51			
		17	ss	18			
	42.5	18	ss	10			Stiff to tough gray silty clay, trace of small to large gravel
		19	ss	10			
		20	ss	16			
		21	ss	14			
	51.5	22	ss	19			Medium dense gray sandy silt, trace of clay and small to large gravel
		23	ss	16			
	58.5	24	ss	10			Loose to medium dense brown fine sand
	60.0						End of Boring

Qu ● LABORATORY ○ PENETROMETER × 1000 — 2 4 6 8 10

Wc ▲ NATURAL — 10 20 30 40 50

ELEV	DEPTH	S	T	N	LR	DD	DESCRIPTION

LEGEND
A - AUGER
ACR - AFTER CASING REMOVAL
AD - AFTER DRILLING
BCR - BEFORE CASING REMOVAL
DEPTH - FEET BELOW GROUND SURFACE
FT - FISH TAIL
HS - HOLLOW STEM AUGER
L - SAMPLE LENGTH
S - SAMPLE NUMBER
SS - SPLIT SPOON
ST - SHELBY TUBE
T - TYPE OF SAMPLE
WC - WATER

OR:	JOHN SEXTON SAND & GRAVEL CO.
OJECT:	CENTRAL AVENUE NEAR SAUK TRAIL
CATION:	COOK COUNTY, ILLINOIS

Walter H. Flood & Co., Inc.
ENGINEERS

SOIL BORING LOG NO. 10

ETHOD OF BORING	HS		
LIT SPOON SIZE:	2 IN.		
T. OF HAMMER	140 LBS.		
INCH DROP	30		
HELBY TUBE SIZE			
ASING USED	60'-2½"IDHS		

WATER LEVEL READINGS

10.5'	W.D.
43.0'	B.C.R.
12.0'	A.C.R.
12.0' @ 0	HRS. A.D.
	HRS. A.D.

DRILLING DATA

DATE	11/25/74
FOREMAN	DL
JOB NO	74050138-1
VERT SCALE	1" = 10'

BACKFILLING DATA

DATE
BY
METHOD
GROUT
QUANTITY:

ELEV.	DEPTH	S	T	N	LR	DD	DESCRIPTION	Qu ● LABORATORY O PENETROMETER × 1000 (2 4 6 8 10)
	0.0						GROUND SURFACE ELEVATION 732	
							Black loam "topsoil"	
	1.0	1	ss	14			Very tough to hard brown and gray silty clay with sand layers	
		2	ss	11				
		3	ss	27				9000+
		4	ss	25				9000+
		5	ss	18				9000+
	12.5	6	ss	9			Stiff to tough gray sandy clay	
	15.0	7	ss	13			Very tough gray silty clay, trace of sand	
		8	ss	18				
	20.0	9	ss	13			Medium dense gray medium sand with some silt	
	22.5	10	ss	15			Very tough gray silty clay, trace of small gravel and occasional boulders	
		11	ss	23				
		12	ss	19				
	30.0	13	ss	15			Tough gray sandy clay	
		14	ss	14				
	35.0	15	ss	16			Very tough gray silty clay, trace of small to large gravel	
		16	ss	24				
		17	ss	14				
		18	ss	23				
	45.0	19	ss	30			Medium dense to dense brown and gray medium to coarse sand trace of small gravel and silt	
		20	ss	33				
	50.0	21	ss	20			Medium dense gray silt with fine gray sand	
	52.5	22	ss	21			Tough gray silty clay	
	55.0	23	ss	12			Medium dense brown clayey silt and sand	
	58.5	24	ss	34			Medium dense fine brown sand, trace of silt	
	60.0						End of Boring	

ELEV	DEPTH	S	T	N	LR	DD	DESCRIPTION	(10 20 30 40 50) Wc ▲ NATURAL

LEGEND
A AUGER
ACR AFTER CASING REMOVAL
DEPTH - FEET BELOW GROUND SURFACE
FT - FISH TAIL
HS - HOLLOW STEM AUGER
S - SAMPLE NUMBER
SS SPLIT SPOON
ST SHELBY TUBE

WALTER H. FLOOD & CO., INC.

SOIL BORING LOG EXPLANATION

TEXTURAL CLASSIFICATION

Texture	Symbol	Abbreviation
Boulder		Bo
Gravel		GR
Sand		S
Silt		Si
Clay		C

Size	Abbreviation	Soil Particle Size
		over 3.0"
Large	L	1.0" to 3.0"
Medium	M	.38" to .99"
Small	Sm	2.0mm to .38"
Coarse	Co	.75mm to 1.99mm
Medium	M	.25mm to .74mm
Fine	F	.074mm to .24mm
		.005mm to .073mm
		Smaller than .005mm

COHESIVE SOIL CLASSIFICATION

Class	Symbol	Abbreviation	Major Soil Constituent, % of Dry Weight Sand	Silt	Clay
Clay		C	less than 50	less than 50	20–100
Silty Clay		SiC	less than 20	50–80	20–50
Sandy Clay		SC	50–80	less than 20	20–50

Consistency	Abbreviation	N	Qu
very soft	VS	0–2	less than 700
soft	S	3–4	700–1200
stiff	ST	5–8	1201–2000
tough	T	9–16	2001–4000
very tough	VT	17–30	4001–8000
hard	H	over 30	over 8000

If the clay content of a soil is great enough the clay characteristics dominate the soil mass. CLAY becomes the soil classification with the other constituents being modifying.

NON-COHESIVE SOIL CLASSIFICATION

Class	Symbol	Abbreviation	Major Soil Constituent, % of Dry Weight Sand	Silt	Clay
Silt		Si	less than 20	80–100	less than 20
Sand		S	80–100	less than 20	less than 20

Density	Abbreviation	N
very loose	VL	0–4
loose	L	5–9
medium dense	MD	10–29
dense	D	30–49
very dense	VD	50 and over

If the sand or silt content of a soil is great enough the soil becomes non-cohesive or semi-cohesive. The soil classification becomes SAND or SILT with the other soil constituents being modifying.

QUANTITY MODIFIERS

Term	Abbreviation	% of Dry Weight
trace or occasional	TR or OC	0–10
little	LI	11–20
some	SO	21–35
and or with	& or w/	36–50

WATER LEVELS

Symbol	Explanation
→	final water level
WCI	wet cave in
DCI	dry cave in
WD	while drilling

DRILLING AND SAMPLING SYMBOLS AND ABBREVIATIONS

ST	Shelby tube or thin wall tube (ASTM D-1587)
SS	Split spoon or split tube (ASTM D-1586)
A	Auger boring or auger sample
HS	Hollow stem auger
Qu	Unconfined compressive strength, pounds per square foot
N	Standard penetration, blows per foot of 140# hammer, 30" drop, 2" O.D. SS
WO	Washout
C	Core
HA	Hand Auger

OBSERVATION WELLS

We propose to install four (4) observation wells as follows:

1. Near Location B-1 screened elevation 660'-665'
2. Near Location B-2 screened elevation 660'-665'
3. Near Location B-3 screened elevation 675'-680'
4. Near Location B-8 screened elevation 670'-675'

These locations will be permenantly established and background analysis will be obtained upon their confirmation as acceptable locations, suitability of site and operational procedure, etc.

Vicinity wells are plotted in "Exhibit A". Area community wells are drilled 380 to 420 feet deep in the SILURIAN dolo mite.